Loading Conveyors for Chairlifts

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Chairlift loading conveyors are becoming commonplace around the world. This paper historically reviews the first conveyors marketed and discusses the current products available for both fixed grip and detachable lifts. The North American market is just beginning to utilize this technology and this paper explains various options available today.

With the price of new lifts relatively high perhaps a loading conveyor is a solution for increasing your lifts' capacity. This paper dispels some of the myths and gives actual statistics for improved performance of your lifts.

All of the various components from foundations to the control gates are discussed. There is also discussion of unloading carpets and their current applications. ANSI B77.1 is currently considering including both loading and unloading carpets in a separate section of the Standard.

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A Little History

The loading process for chairlifts is still improving. The first chairlifts were easily loaded single chairs and usually required a wool blanket to keep the occupant warm. The lifts were generally long and rather slow by today's standard. Loading was from the side at some angle up to 90°. Along came the double chair but no real changes in loading were required. Many of the first lifts required sidestepping up an embankment to get to the loading position. Remember there were no adjustable terminals or bladed groomers. Then lift capacities were increased with the triple and later quad chairlifts. It became obvious the side loading angles had to change and soon we had bullwheel loading and unloading to save space and improve actual lift capacities. Bullwheel loading and unloading started about 1970 and is the norm for the modern lift of today.

Much has been written since 1969 by the likes of Robert Kinney, Jan Kunczynski, Jon Carrick, Charles Peterson, and others concerning loading and unloading ramp design. NSAA even published guidelines for loading and unloading ramps. B77 .1 has had a couple of rewrites for these particular sections over time. The discussions for loading and unloading have concerned skier ability, speed of the lift, length of the ramps, break-over location, pitch of the ramp, load gates, wait boards, load boards, side boards, height of the carrier above the ramps, foot passengers etc. Still today there is not always uniformity within a resort let alone between ski resorts for lift ramps.

Today with the huge costs of lifts it is imperative to keep the chairlift efficiencies as high as possible. Reducing the number of lift slows and lift stops is a big part of this efficiency equation. Each of us can vividly remember chairlifts that stop frequently and the reaction is generally something like "let's not ride this lift again". Generally lift stops are caused at the load and unload areas by beginners. Lifts that have a mix of skier ability levels are frequently much worse for stops than lifts servicing higher ability skiers.

Loading Conveyor History

Enter the world of loading carpets for chairlifts. In 1987 Doppelmayr started development of the technology. There are significant numbers of units installed in Europe but in the United States we lag behind. The first loading conveyors in the US were installed in 1995 at Crystal Mountain Washington by Dave Kelly from Rocky Mountain Conveyor in collaboration with Poma. Diamond Peak Nevada installed a couple of Doppelmayr units in 1996.

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These first installations used a smooth rubber belt with a glued on polypropylene surface to try to simulate snow. The belts entrained a lot of water that when frozen refused to track correctly until the ice was broken and removed. During the initial startup the belt would wander requiring frequent belt alignment. The alignment was done with tapered rollers on one end similar to adjusting a belt sander. The Crystal Mountain carpets ran for about two years before being removed from service. The Diamond Peak conveyors are still in operation on fixed grip quad lifts.

In 2004 Breckenridge installed a Chairkid loading conveyor on a fixed grip double chairlift. In 2005 Emmegi installed a conveyor at Saint Breauno Quebec. In 2006 Sierra Summit installed a Chairkid loading conveyor on a fixed triple chair and Saint Breuno installed another Emmegi loading conveyor. 2007 saw three carpets installed, two by Chairkid at Mont Garceau and Le Relais in Quebec, and an Emmegi unit installed at Hidden Valley Pennsylvania. In 2008 Emmegi loading conveyors were installed at Hidden Valley Pennsylvania, Santa Fe New Mexico, St. Breauno, Quebec, Bromont, Quebec and Okemo, Vermont. Okemo also installed the first unloading conveyor in the United States by Emmegi in2008. The Le Relais unit installed in 2007 by Chairkid was replaced by an Emmegi conveyor after a fire in 2008 destroyed the original unit. 2008 Chairkid conveyor installations were done at Boyne Michigan, Wisp Maryland, Alta Utah, Mont St. Sauveur Quebec, Alyeska Alaska and Mount Snow Vermont installed the first detachable loading carpet in the North America. To date there are 3 Chairkid installations for 2009 with two at Bridger Bowl Montana and one at Massanutten Virginia.

This picture shows the fire at Le Relais, Quebec on a Chairkid Carpet on a Doppelmayr fixed grip lift. The fire was caused by welding near the carpet. It is very important to understand that the plastic material used for the conveyor chain burns at a very high temperature and is very difficult to extinguish once ignited.

Modern Conveyors

Our current loading conveyor installations' use a chain belt with stripes for lanes. This chain is made of Polyoximoline or POM. It will not absorb water. There were some chains manufactured with rubber molded on the POM but it generally provided too much friction for skiers and was hard to replace as the rubber wore out. The roughed up POM works better even for foot passengers. There are still very successful operations using all of the various types of belting described above.

The advantages of the chain belt are many including no water absorption, modular belting for easy installation, exact tracking, ease in replacement of broken or worn elements, belt surface not too slippery, form fit for the power transmission of the drive and return drum sprockets.

What can a loading conveyor do? It is a tool to index passengers for proper loading of your chairlift. On first considering a loading conveyor one might think that the speed of the chairlift could be increased for higher hourly capacity. There can perhaps be some slight speed and capacity increases, but the best results come from reducing the stops and slows for design speed and carrier spacing of the chairlift. The European Code allows fixed grip lift speeds to be increased about 12% to 15% from their allowable maximum speeds, depending on the carrier capacity, with the use of a loading carpet.

Mount Snow reports that the detachable quad loading conveyor they installed reduced their lift stops by 50% and slows by 70% from previous years. This bottom to summit lift sees heavy use from all types of skiers as it is adjacent to a hotel in the base area. Fixed grip lifts see similar results as well.

Fixed grip lift conveyors are about 10 meters in length as the passengers index between the moving carriers. The difference in the carrier speed to the conveyor speed (1/3 rope speed) allows the chair to catch up to the moving passengers. The loading point for any fixed grip conveyor is at least 1 meter prior to the end of the conveyor. For a detachable lift the guests are moved to a stationary point at the load board where a slow moving carrier picks them up. The detachable lift conveyor is about 4.5 meters long.

A critical component for the loading conveyor is the load gates. The gates control the start of the load process. As a carrier passes the wait area the gates open to allow passage of the skiers down a small slope onto the moving conveyor chain. The larger capacity carriers usually use a staggered gate opening in pairs of two. The gates of today are very reliable and rugged compared to their predecessors'. The controls for the gates are triggered by a carrier passing a particular triggering switch with a cable tachometer device to count pulses thus opening the gates. The gate opening is fully adjustable.

The load gates must be positioned as close to the path of the carrier as possible. There should be decline at the gate location so that the skier is actually contacting the gate paddle itself. Signs on the gate stating "lean on me" work well so that when the gate opens no effort is required of the skier to move forward onto the loading conveyor.

It is interesting to watch a lift with a conveyor load. The beginner skier has very little knowledge of the whole loading process and lets gravity work for them. An advanced skier tries to barge the gates or walk forward on the conveyor carpet for the first couple of loading cycles. After that you notice a much improved process for all. The beginner skiers rarely have any issues loading with a conveyor.

Controls for the conveyor are much the same as for the chairlift. The speed of the conveyor is directly proportional to the rope speed. This is a fixed relationship so that when you adjust the lift speed the conveyor adjusts proportionally. The operator can hold the gates closed with a button if required. The conveyor can be jogged without the lift running to assist in opening for the day.

One of the most misunderstood parts of the loading conveyor system is that there is no current requirement for a transition stop at the end like the skier conveyors. The loading conveyors use a very stiff belt/snow scraper at the transition point. It is very difficult to catch anything between the belting and the conveyor chain (see photos). The position is monitored by the lift operator as well.

Operation of a conveyor without gates is not permitted in Europe. Gate failure requires stopping the conveyor. In the event of a power loss or problem with the load gates the lift can still be loaded successfully by putting a thin coating of snow on the conveyor chain.

The decline of the load ramp from the gates to the surface of the load conveyor works very well at 8% to 10%. Skiers have no problem getting to the load point in a timely manner.

Unloading Conveyors

This is the Emmegi Unloading Conveyor at Okemo Vermont.

Unloading conveyors must operate at a greater speed than the chairlift to accelerate the skier away from the carrier. A substantial nearly flat area is required. A power loss requires a different solution to successfully off load the chairlift. The flatness and length of the unloading conveyor may require a lowering of the conveyor to increase the slope of the ramp and a substantial amount of snow to be shoveled. This could take valuable employee time to get the lift operable. A lift could be unloaded slowly by utilizing extra staff to assist people off the unload ramp. Perhaps the unloading conveyor should have an auxiliary power unit.

Foundations

Design and installation of the concrete pit is rather easy. Doppelmayr often includes the design of the loading terminal to accommodate a loading conveyor on new installations. Older lifts sometimes require additional considerations but can generally accommodate a loading conveyor.

This is an older CTEC lift just starting to dig the hole for the pit at WISP Maryland in 2008.

There are two kinds of pits, shallow and deep. The deep pit allows for easier access to the machinery but is a little more expensive. Both types should provide adequate space around the conveyor for maintenance, proper drainage, and floor heating to melt snow that is deposited in the pit. Some shallow pits require use of a floor creeper to get around the machinery.

Mount Snow 2008 – Detachable – Deep pit without front load boards attached yet. Shows snow scrapper on front drum. Note center post of load gate removed for ADA access and lane markings on the carpet.

Mount Snow – 2008 – deep pit – drive motors for load gates – manual release levers on each motor.

Alta – 2008 – adjustable terminal

Conclusion

The loading and unloading of chairlifts can be greatly improved with the use of these carpets. The units are particularly useful on heavily used lifts. There use will become commonplace in North America in the next few years. B77 will catch up with this technology and include it in the lift code. I hope this paper helps in understanding this application for loading carpets.

The future for loading conveyors will include side angle loading (already developed by Chairkid but not yet installed) and automatic height adjustment of the carpet based on user height.